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# Environmental Health Considerations of Artificial Turf

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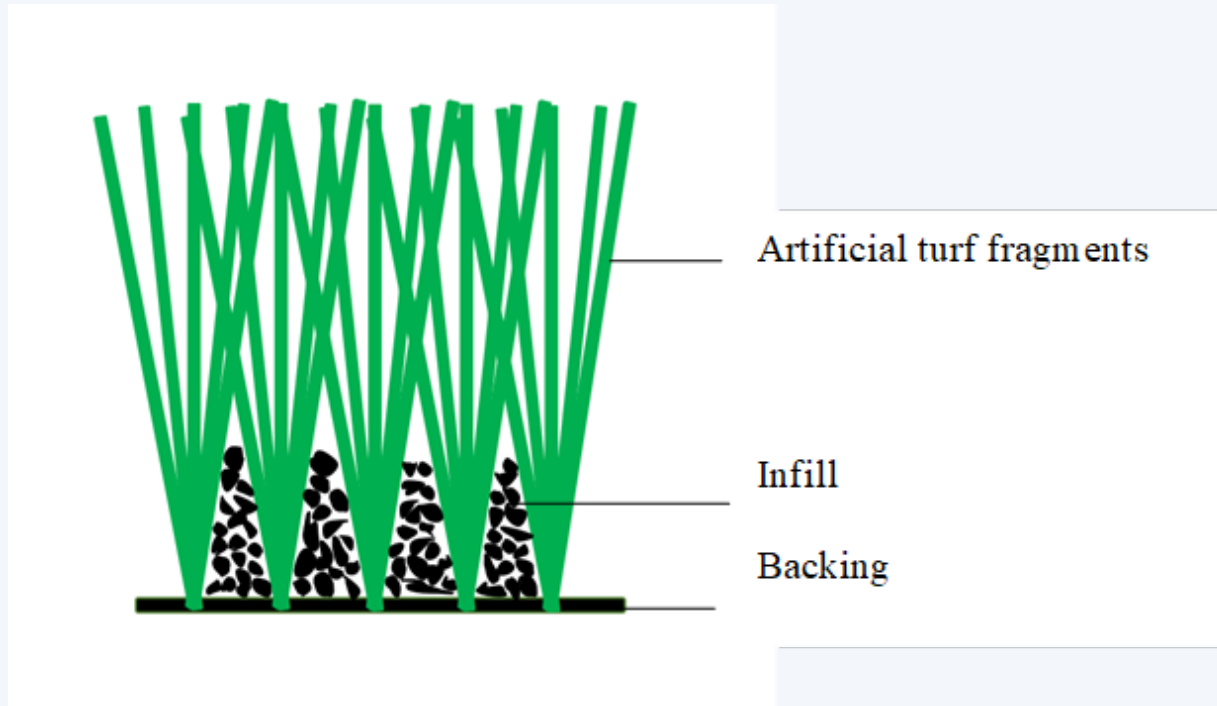
# Overview

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- What is artificial turf?
- Committee Questions

# What is artificial turf?

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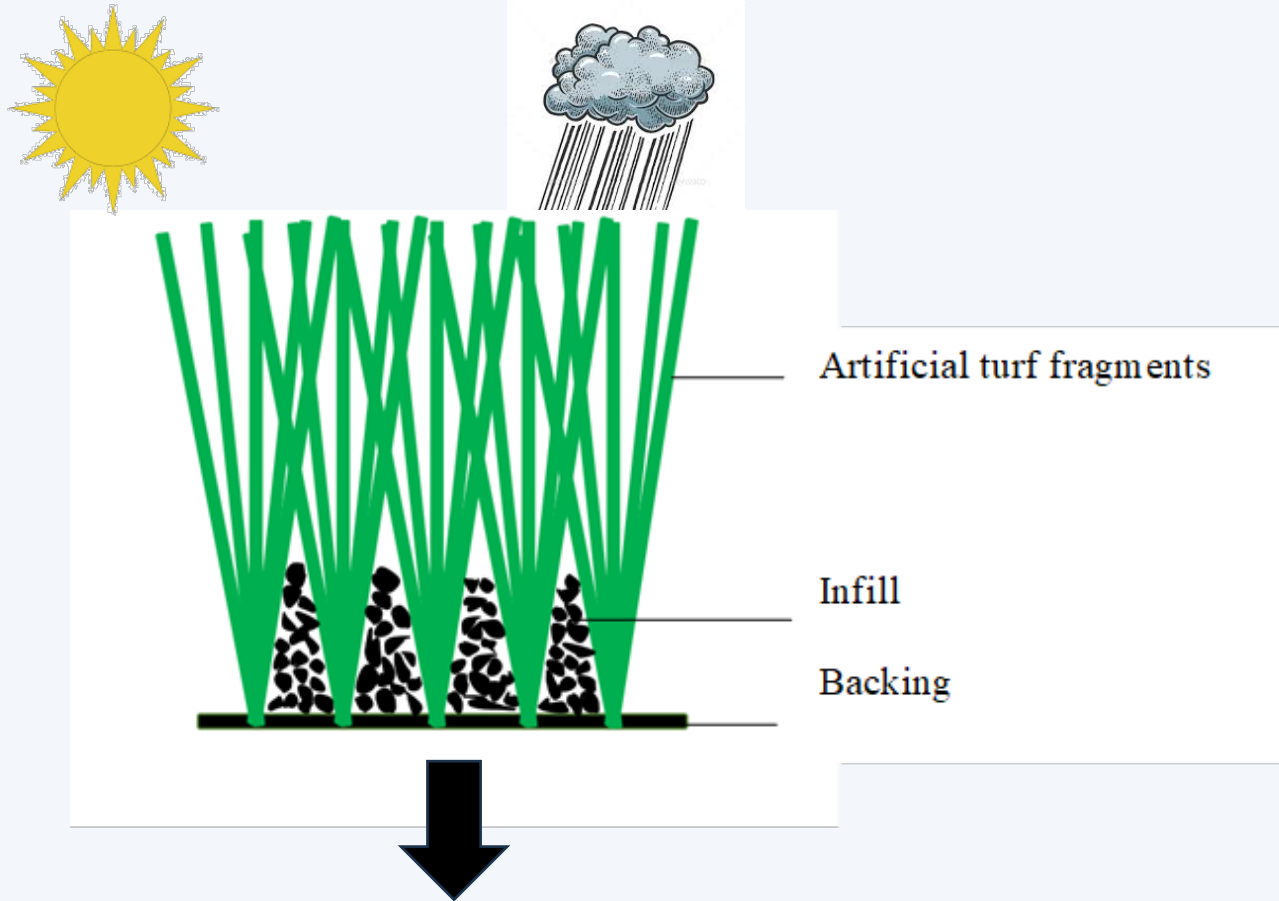


**Turf fragments:** Usually made of polyethylene plastic with PFAS chemical detected

**Infill:** tire crumb, other rubbers (EPDM, TPE), acrylic-coated sand, mineral and plant-based materials

**Backing:** polyester, polypropylene with urethane

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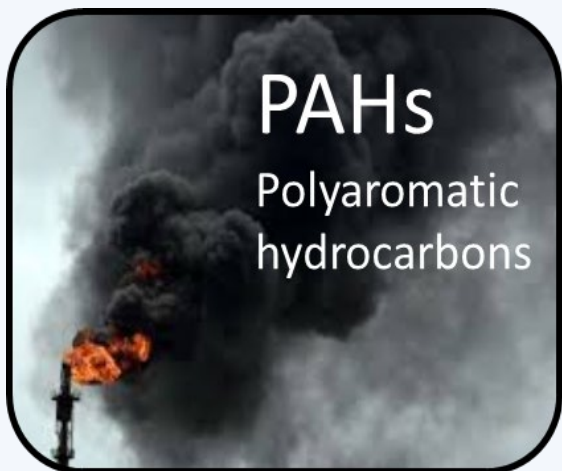
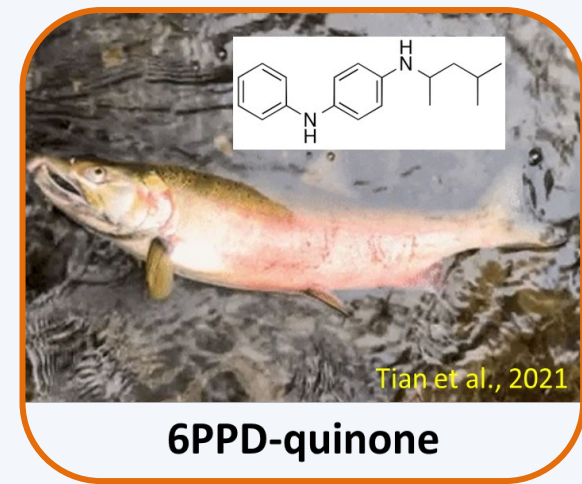
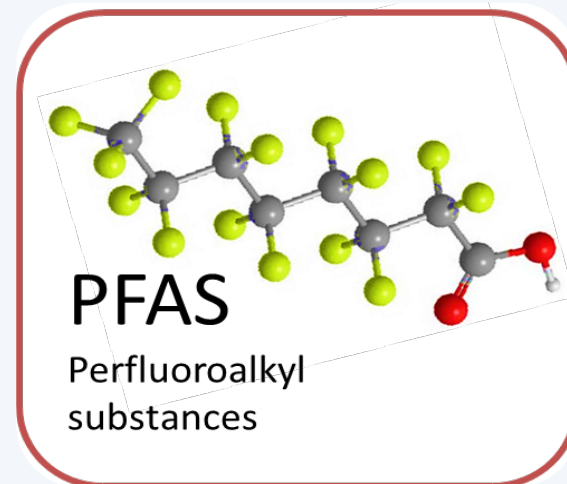
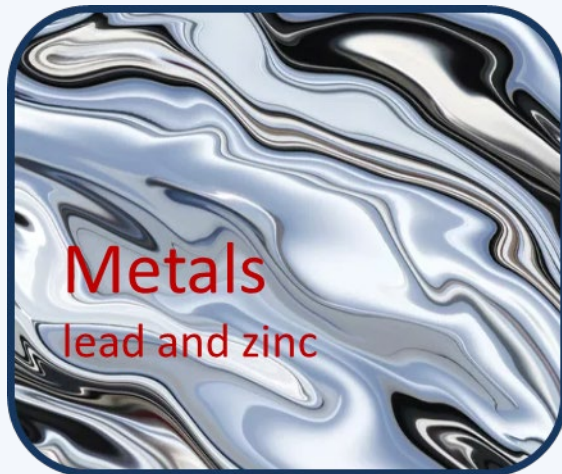
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Transformation of chemicals and leaching into the environment: MATF and MRP

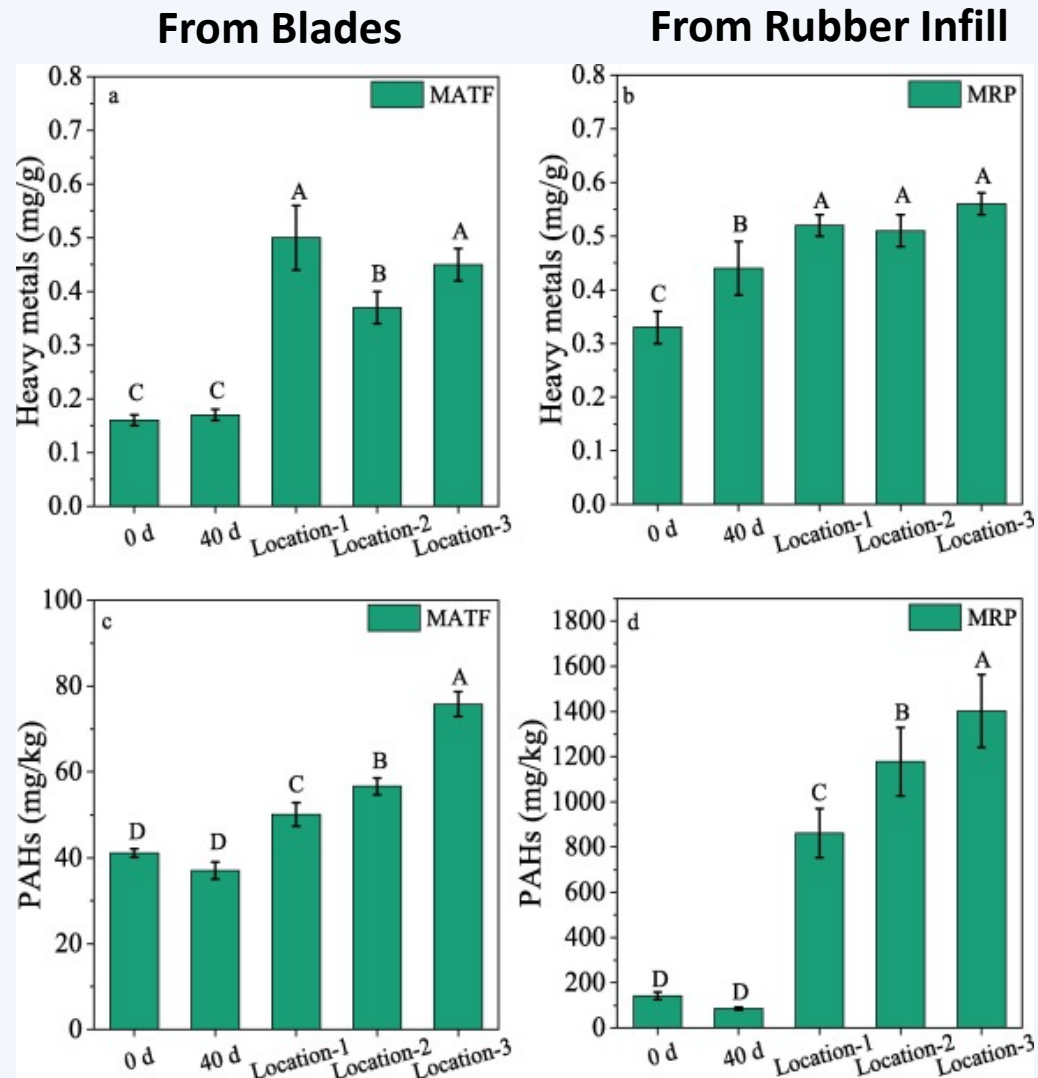


Most important chemicals for potential impacts to the environment, particularly on wildlife and aquatic organisms.

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# Actual use increases release of toxic pollutants



When fields are exposed to the sunlight and weather, they **release** more toxic chemicals than expected from lab studies.

Surprising is the levels of metals and polyaromatic hydrocarbons (PAHs) in the plastic blades.

Leachates from both plastic blade particles and rubber infill decreased cell survival in an *in vitro* assay.




# Effect of heat from artificial turf fields on wildlife

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- Run-off from “hot” artificial turf fields could increase the water temperature in surrounding wetlands.
- Impacts: temperatures above tolerance limits of species and decreased dissolved oxygen.
- Impacts would be very site specific, how much run-off, where is it going, what are the characteristics of the area it is flowing into.





# Is infill migration a concern for the environment?

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- European Union (Sept. 2023) banned products with “intentionally added microplastics” including “granular artificial turf infill.” (Zuccaro et al. 2024)
- Leachate causes severe developmental toxicity in vertebrates (Xu et al. 2019).
- Generally agreed to the most harmful component for human and environmental health due to:
  - Microplastics
  - Metals (especially zinc)
  - 6PPD-quinone
  - PAHs

Xu et al. 2019, *PNAS*. 116: 25156

Zuccaro et al. 2024, *Environ Sci Technol*. 58:2591.



Are you familiar with alternate infills to crumb rubber and could you talk about them in terms of relative impact?

**Table 2: Comparing infills: Selected categories of chemicals of concern**

Category	Tire crumb	EPDM	Shoe materials <sup>a</sup>	TPE	Acrylic-coated sand	Mineral- or plant-based
Lead <sup>b</sup>	Present	Present	Present	Present	Below detection limit <sup>c</sup>	Absent in some cases
Zinc <sup>b</sup>	Present	Present	Present	Present	Present <sup>c</sup>	Present in some cases
Other metals <sup>b</sup>	Present	Present	Present	Present	One additional metal present <sup>c</sup>	Present
Vulcanization compounds <sup>d</sup>	Present	Present	Present	Generally absent	Expected to be absent	Zeolite, when present, poses serious respiratory hazard. Plant-based materials can pose concerns related to dust, fungi, or allergens. Vulcanization compounds and phthalates are expected to be absent; VOCs and PAHs are expected to be low or absent. <sup>h</sup>
Phthalates	Present <sup>e</sup>	Present (lower) <sup>f</sup>	May be present, but subject to RSL	Present <sup>g</sup>	Expected to be absent	
VOCs	Present <sup>e</sup>	Present (lower in some cases, higher in others) <sup>f</sup>	Expected to be present, but subject to RSL	Present (lower) <sup>g</sup>	Expected to be absent	
PAHs	Present <sup>e</sup>	Present (lower) <sup>f</sup>	May be present, but subject to RSL	Present (lower) <sup>g</sup>	Below detection limit <sup>c</sup>	
PAHs (TURI sample) <sup>i</sup>	Present (highest) (548 mg/kg)	Present (20 mg/kg)	Present (55 mg/kg)		Present (below 10 mg/kg)	

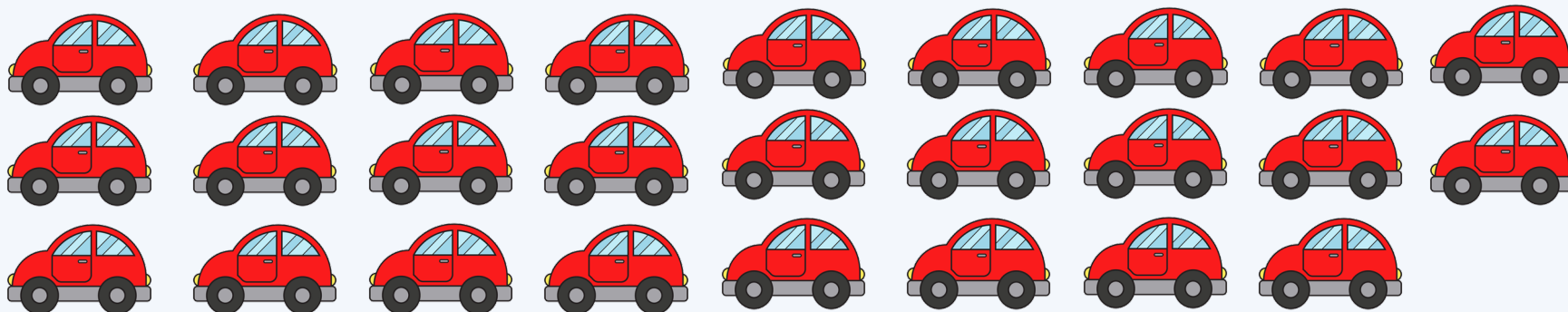
# Climate change impacts of a lack of recycling of artificial turf

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Life cycle assessment of an artificial turf playing field in Toronto, Canada was estimated as **55.6 tonnes CO<sub>2</sub> eq.**, while not recycling the field would double that number (Cheng et al., 2014).

***26x's the footprint of a typical car usage over a year.***

Plastics industry also sustains the fossil fuel sector, with up to 8% of fossil fuel use going into plastics (Bauman, *Yale Climate Connections*).



# References:

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